A Method for Estimating Live Weight and Body Length from the Shell of *Aplysia willcoxi* Heilprin, 1886

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(2 Text figures)

Obtaining reliable size measurements of mollusks which possess only thin, internal shells has often posed problems due to the extreme contractility of the animals. The problems are compounded when one tries to compare data from living and dead specimens. In my studies of the sea hare *Aplysia willcoxi* Heilprin, 1886, at Cedar Key, Florida, I found that references to the size of the animals rarely describe the position of the animals when measured (Andrews, 1971; Eales, 1960; Gray, 1940; Gunter & Hall, 1963 and 1965; Hackney, 1944; Heilprin, 1886; Moore, 1961; Zinn, 1950). Only one report includes data on shell lengths (Zinn, *op. cit.*). No references were found to the weights of the sea hares.

I attempted to find a consistent relationship between live weight, body length, and shell length of freshly caught sea hares. This relationship would enable me to obtain a good estimate of live weight and body length from the shells of dead specimens.

Seventy-five sea hares were weighed and measured within two hours of capture. Each sea hare was blotted on paper towels and weighed to the nearest 0.1 g on a triple beam balance. To obtain a standard measurement of body length, each sea hare was placed in a large enamel pan filled with seawater. The animal was then prodded into swimming. In this position the animal was extended and measurements to the nearest centimeter were made when viewing the sea hare from directly above. The body length was taken as the distance from the tip of the oral tentacles to the tip of the tail.

From 13 of these animals the shells were extracted and the lengths were measured to the nearest millimeter. This was done while the shells were still wet since the lightly calcified shells tend to shrink upon drying.

Figure 1 plots the Log. body weight against Log. body length. The least squares regression line fits the equation

Log. body length = 0.36 Log. weight + 0.4414.

($L = 2.76\ W^{0.36}$; correlation coefficient, r, = 0.95; standard error of the slope = 0.01; N = 75).

Figure 2 is a plot of the Log. body weight against Log. shell length. The data fit the regression equation (N = 13; r = 0.98; standard error = 0.01; $SL = -1.08\ W^{0.27}$)

Log. shell length = 0.27 Log. body weight –0.0349.

By using a Student's t test, both slopes were found to be significantly different from 0 ($p<0.01$ and $p<0.001$, respectively).

By using these two graphs, it is possible to estimate the live weight and body length from the shell of a dead *Aplysia willcoxi,* provided that the shell has not been allowed to dry out. Since the shells of *Aplysia* do not appear to undergo any significant shrinkage or distortion in formalin or 70% alcohol, these relationships should also be useful in working with museum specimens. Similar allometric equations probably exist for other members of the genus *Aplysia* and should be useful to students of the group.

Despite the author's efforts to standardize the animals' position when the body lengths were measured, it is still this parameter which is the most difficult to measure ac-

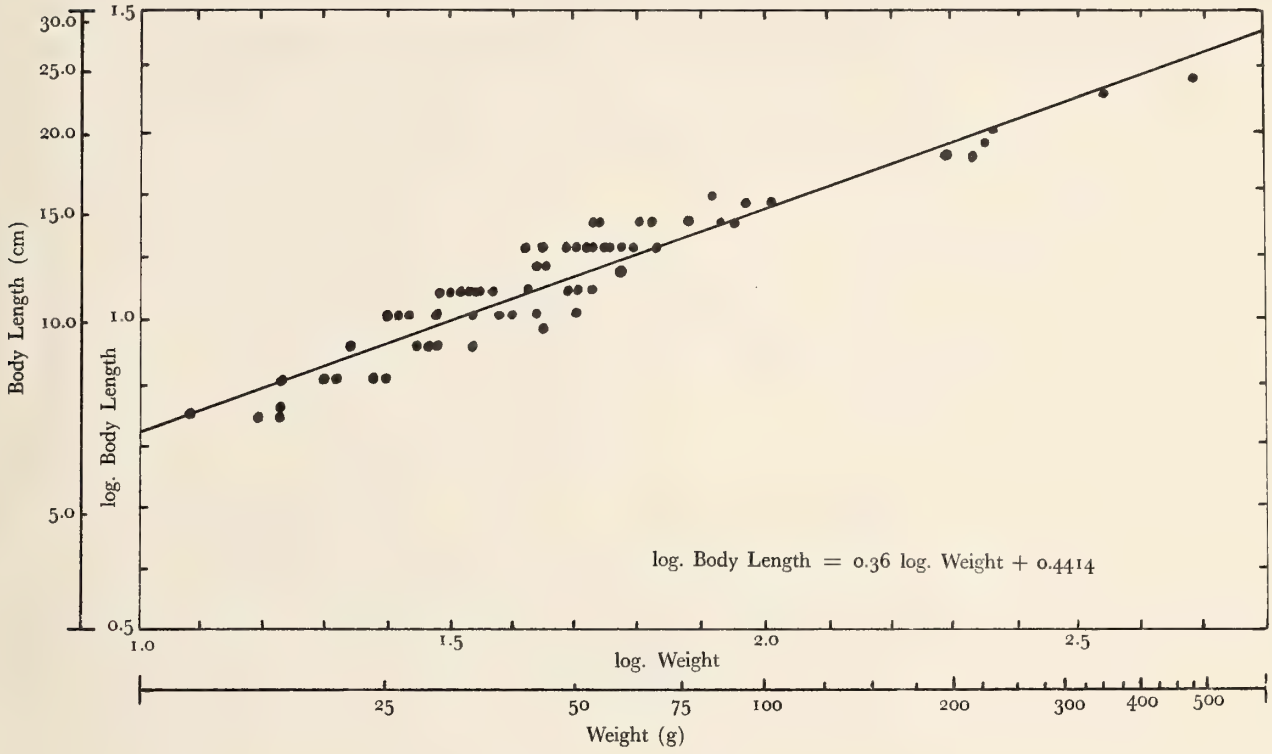

Figure 1

Log. body length plotted against Log. live weight

curately. In the normal range of positions that a sea hare may adopt there is an estimated maximum change of ⅓ of the total body length. Although it is difficult to measure a moving animal, it is my belief that greater accuracy is gained by having each animal in the same position. However, weight and shell length are probably the best indicators of the size of *Aplysia*.

Zinn (1950) has noted that the *Aplysia willcoxi* from Rhode Island waters appear to be larger than those reported from further south. The shells measured by Zinn ranged from 5.8 cm to 9.4 cm. The largest sea hare recorded in the present study was 550.1 g and had a shell length of 5.3 cm. It would be interesting to see if data from New England specimens of *A. willcoxi* would fall on the allometric curves.

ACKNOWLEDGMENTS

I am grateful to Drs. Frank J. Maturo, Jr. and E. Lowe Pierce for their help and guidance during the course of my studies. I also wish to thank Dr. Thomas Krakauer for his help with the statistics and for his critical reading of the manuscript.

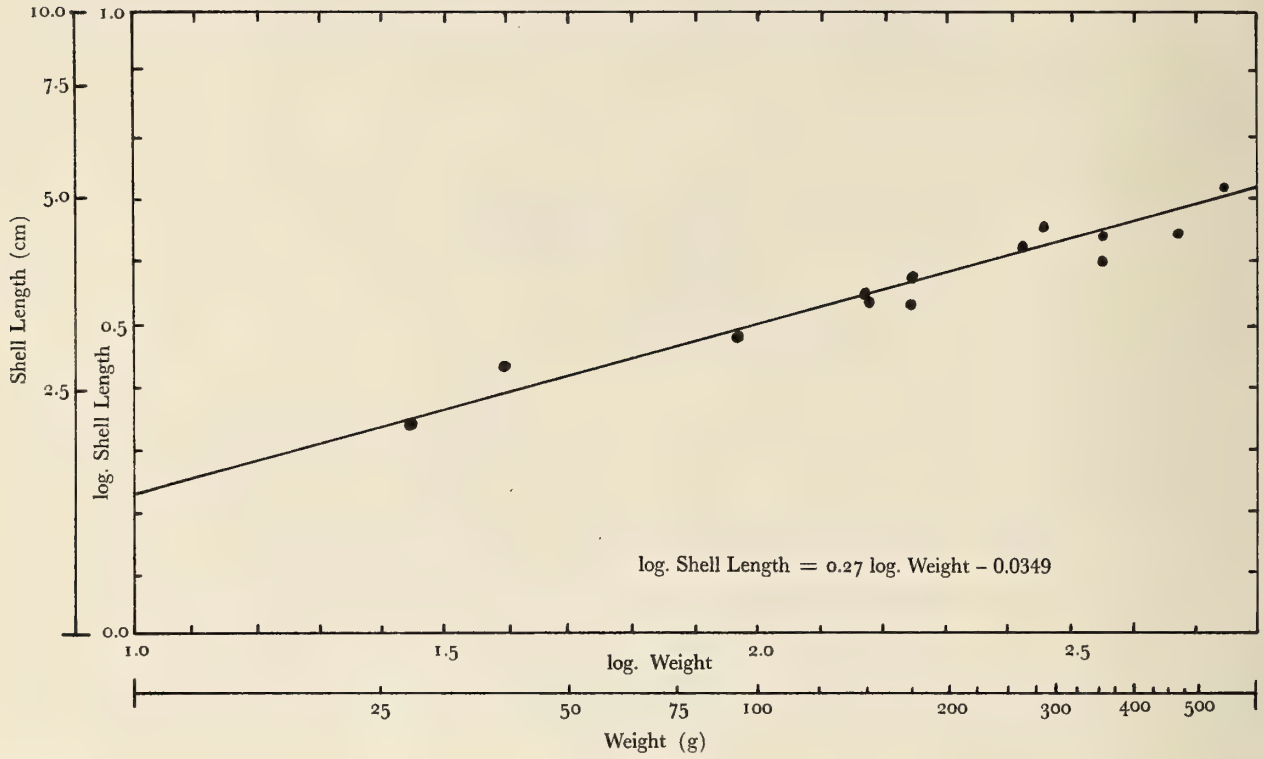

Figure 2

Log. shell length plotted against Log. body weight

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